

NEW OBSERVATIONS ON *CLADOCARPUS FLEXUOSUS*  
NUTTING, 1900 (HYDROZOA: PLUMULARIIDAE),  
A BATHYAL HYDROID FROM THE GULF OF MEXICO

Dale R. Calder

*Abstract.*—The hydroid *Cladocarpus flexuosus* Nutting, 1900, is known from a single, fragmentary colony collected at a depth of 1719 m in the Gulf of Mexico. New material, obtained in deep water (788–1829 m) collections from DeSoto Canyon off the coast of Alabama, USA, is described and illustrated here. The gonothecae and phylactocarpia of this species are described for the first time. Phylactocarpia arise as hydrocladial appendages, confirming that the species belongs in the genus *Cladocarpus* Allman, 1874. The type of *C. flexuosus* differs from that of the related species *C. dolichotheca* Allman, 1877, in having cone-shaped instead of cylindrical hydrothecae, and more weakly developed septa in the internodes of the hydrocladia.

---

*Cladocarpus* Allman, 1874, is a widely distributed, largely deep water genus of hydroids extending to depths in excess of 5000 m. Of some 45 nominal species referred to the genus by Vervoort (1966), 11 were admitted with some reservation. Genera in the plumularian subfamily Aglaopheniinae, to which *Cladocarpus* belongs, are distinguished largely on the basis of their accessory reproductive structures (Millard 1975), and gonophores of these 11 species have not been described. One of those doubtfully included in *Cladocarpus* by Vervoort (1966) was *C. flexuosus* Nutting, 1900, a species known from a single, incomplete, sterile colony.

Several specimens of *C. flexuosus*, including a colony with gonophores, were recently identified in samples of deep water benthos from the northeastern Gulf of Mexico. The hydroid is redescribed here, and types of the morphologically similar species *C. flexuosus* and *C. dolichotheca* Allman, 1877, are compared.

Family Plumulariidae L. Agassiz, 1862

Subfamily Aglaopheniinae Stechow, 1911

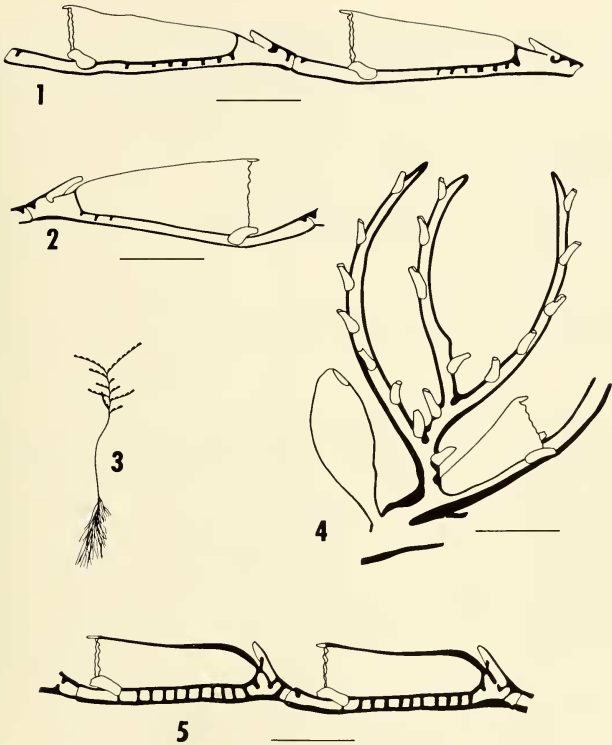
Genus *Cladocarpus* Allman, 1874

*Cladocarpus flexuosus* Nutting, 1900

Figs. 1–4

*Cladocarpus flexuosus* Nutting, 1900:114, pl. 27, figs. 11–13.

*Material examined.*—Northeastern Gulf of Mexico, *Albatross* sta 2384 (28°45'N, 88°16'W), 1719 m, type-slide of a single hydrocladium, USNM 18679.—DeSoto Canyon, N.E. Gulf of Mexico, *Alaminos* sta 67A5-6B (28°48'N, 87°03'W), 788 m, 16 Jul 1967, benthic skimmer, one infertile colony, 7 cm high, ROMIZ B307.—DeSoto Canyon, N.E. Gulf of Mexico, *Alaminos* sta 68A7-14B (28°56'N, 87°32.7'W), 1829 m, 8 Aug 1968, benthic skimmer, one fertile, fragmentary colony, 3 cm high; one hydrocaulus with hydrorhizal fibers, 5 cm high; ROMIZ B308.—DeSoto Canyon, N.E. Gulf of Mexico, *Alaminos* sta 66A9-XV (28°15'N,



Figs. 1-4. *Cladocarpus flexuosus*: 1, Hydrothecae, ROMIZ B309; 2, Hydrotheca from type-slide, USNM 18679; 3, colony, one-half life-size, ROMIZ B307; 4, Phylactocarp and gonotheca, ROMIZ B308; Fig. 5, *Cladocarpus dolichotheca*, hydrothecae, MCZ. Scale bars = 500  $\mu$ m.

87°02'W), 1000 m, 11 Jul 1966, midwater trawl on bottom, two fragmentary, infertile colonies, 3 cm and 5 cm high; one hydrocaulus with hydrorhizal fibers, 7 cm high; ROMIZ B309.

*Description*.—Colony with basal tuft of root-like fibers arising from hydrorhizal tubules. Hydrocaulus about 200–300  $\mu$ m wide basally, unbranched, monosiphonic, lacking septa, separated into proximal and distal parts by 2–3 hinge-joints. Proximal part of hydrocaulus straight, nematothecae present at upper end only, nodes and hydrocladial apophyses absent, perisarc moderately thick. Distal part of hydrocaulus geniculate, nodes indistinct if detectable at all, internodes long, slender, each with lateral apophysis distally and a variable number of nemato-

Table 1.—Size comparisons of R/V *Alaminos* hydroids (ROMIZ) with type-specimens of *Cladocarpus flexuosus* (USNM 18679) and *C. dolichotheca* (MCZ, no catalog number). Measurements in  $\mu\text{m}$ .

	<i>C. flexuosus</i> USNM 18679	<i>C. flexuosus</i> ROMIZ B307	<i>C. flexuosus</i> ROMIZ B308	<i>C. flexuosus</i> ROMIZ B309	<i>C. dolicho-</i> <i>theca</i> (MCZ)
Hydrocladium					
Internode length	1,681–1,723	1,394–1,574	1,532–1,681	1,574–1,702	1,085–1,404
Diameter at node	85–96	81–96	66–143	79–119	70–112
Hydrotheca					
Total length	968–1,042	936–1,021	874–1,032	915–1,042	746–960
Diameter at aperture	404–447	298–330	362–415	317–381	298–317
Median Nematotheca					
Total length	228–251	202–230	208–245	202–219	261–298
Lateral Nematotheca					
Total length	177–194	168–191	160–191	153–177	177–205

thecae, 1–3 along internode axis, one in axil of each apophysis, and one reduced nematotheca on apophysis. Apophyses moderately long, given off alternately from opposite sides of hydrocaulus, each supporting hydrocladium. Hydrocladia unbranched, inserted directly on apophysis without intermediate internodes, up to 22 mm long, divided into long, sinuous internodes by nearly transverse nodes. Internodes very slender, each with one frontally-placed hydrotheca, one median inferior nematotheca, one pair of lateral nematothecae, and variable number of internodal septa, usually 2 proximal to, 1 distal to, and 2–9 beneath the hydrotheca. Hydrothecae distant, elongate, cone-shaped but variable in outline, abcauline and adcauline walls varying from convex to concave, intrathecal septa lacking, perisarc moderately thin. Hydrothecal aperture oval, plane of orifice perpendicular to axis of internode, margins with linguiform median abcauline tooth, bordered on either side by about 6–7 teeth, teeth often little more than faint undulations, particularly away from abcauline wall. Median inferior nematotheca one-chambered, immovable, long, anvil-shaped, free from hydrotheca, aperture scoop-shaped. Lateral nematothecae one-chambered, immovable, sac-shaped, projecting beyond hydrothecal margin, aperture terminal.

Phylactocarpia about 2 mm long, dichotomously branched, antler-shaped, arising 1 per hydrocladium between, and lateral to, median inferior nematotheca and hydrotheca of first hydrocladial internode, forming double row over hydrocaulus and arching over gonothecae, bearing nematothecae similar in morphology to median inferior nematothecae of hydrocladia, faint nodes near base of each branch, septa lacking. Gonothecae elongate-oval, about 0.8 mm long, one per phylactocarp, arising from hydrocladial apophysis by short stalk, aperture oval, subterminal, sex indeterminable.

*Remarks.*—The presence of gonothecae and phylactocarpia in material of *C. flexuosus* from *Alaminos* station 68A7-14B (ROMIZ B308) removes any doubt about the generic identity of this species. In having gonothecae protected by phylactocarpia arising as appendages of alternately disposed hydrocladia, *C. flex-*

*uosus* conforms with contemporary diagnoses of the genus *Cladocarpus* (see Millard 1975). Two distinctly different types of phylactocarpia occur in *Cladocarpus*, a difference which suggests possible grounds for eventual subdivision of the genus. Phylactocarpia of *C. flexuosus* resemble those of *C. formosus* Allman, 1874, the type-species of *Cladocarpus* by monotypy.

A comparison of *Alaminos* hydroids from DeSoto Canyon (ROMIZ B307, ROMIZ B308, ROMIZ B309) with type-material of *Cladocarpus flexuosus* (USNM 18679) leaves little doubt that all belong to the same species. The aperture diameters of hydrothecae in the type-slide generally exceed those of *Alaminos* specimens (Table 1, Figs. 1, 2), but this difference is attributed to flattening of the hydrothecae by the coverslip. Median inferior nematothecae are somewhat closer to the hydrothecae in the type, although their position and length are variable in *Alaminos* material. Slight differences in such an inconstant morphological character are not considered to be taxonomically important. The number of internodal septa beneath the base of the hydrotheca is also variable in *Alaminos* hydroids, and apparent differences between these specimens and the type (Figs. 1, 2) are not regarded as significant either.

Hydroids of *C. flexuosus* bear considerable resemblance to *C. dolichotheca* Allman, 1877, and phylactocarpia of both species are antler-shaped. Specimens of *C. flexuosus*, including the type-material (USNM 18679), were compared with the probable type of *C. dolichotheca* (MCZ, no catalog number). From this comparison (Table 1, Figs. 1, 2, 5), it was evident that *C. flexuosus* differs from *C. dolichotheca* in having (1) cone-shaped instead of cylindrical hydrothecae, (2) fewer and less well developed septa in the hydrocladial internodes, (3) longer hydrocladial internodes, (4) median inferior nematothecae seated well below instead of adjacent to the hydrothecae. While acknowledging that species of *Cladocarpus* display considerable variability, none of the colonies of *C. flexuosus* examined here approached the form of *C. dolichotheca* in the characters listed above. Accordingly, Nutting's (1900) view that the two are closely related but distinct species is upheld here.

Nutting (1900) distinguished *C. flexuosus* from *C. tenuis* Clarke, 1879, based on hydrotheca shape. The abcauline wall of the hydrotheca is decidedly concave in *C. tenuis*, and convex to slightly concave in *C. flexuosus*. The phylactocarp of *C. tenuis*, as described by Vervoort (1966), is decidedly different from that of *C. flexuosus*.

Present records do little to extend the known range of *C. flexuosus*. All reported collections of this species are from the DeSoto Canyon area off the coast of Alabama.

#### Acknowledgments

*Alaminos* hydroids described in this note were collected by Dr. W. E. Pequegnat. I thank Dr. Linda Pequegnat for sending me the specimens and relevant collection data. Thanks are also due to Dr. F. M. Bayer of the United States National Museum of Natural History, Smithsonian Institution, and Dr. K. P. Sebens of the Museum of Comparative Zoology for allowing me to examine type-specimens from their collections.

## Literature Cited

- Agassiz, L. 1862. Contributions to the natural history of the United States of America. Volume 4. Little, Brown and Company, Boston, 380 pp.
- Allman, G. J. 1874. Report on the Hydroida collected during the expedition of H.M.S. Porcupine.—Transactions of the Zoological Society of London 8:469-481.
- . 1877. Report on the Hydroida collected during the exploration of the Gulf Stream by L. F. de Pourtalès, Assistant United States Coast Survey.—Memoirs of the Museum of Comparative Zoology at Harvard College 5(2):1-66.
- Clarke, S. F. 1879. Report on the Hydroida collected during the exploration of the Gulf Stream and Gulf of Mexico by Alexander Agassiz, 1877-78.—Bulletin of the Museum of Comparative Zoology at Harvard College 5:239-252.
- Millard, N. A. H. 1975. Monograph on the Hydroida of southern Africa.—Annals of the South African Museum 68:1-513.
- Nutting, C. C. 1900. American hydroids. Part I. The Plumularidae.—Smithsonian Institution, United States National Museum, Special Bulletin 4(1):1-285.
- Stechow, E. 1911. Über die Hydroiden der Deutschen Tiefsee-Expedition, ein neues Genus thekater Hydroiden.—Zoologischer Anzeiger 37:193-197.
- Vervoort, W. 1966. Bathyal and abyssal hydroids.—Galathea Report 8:97-174.

Department of Invertebrate Zoology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6, Canada.